United States Patent [19]
Carthew et al.
[11] Patent Number: 4,764,108
[45] Date of Patent: Aug. 16, 1988

[54] MODULAR OVEN

[75] Inventors: **Maximilian K. Carthew**, Rochester Hills; **Joseph D. Donahue**, Troy, both of Mich.
[73] Assignee: **Haden Schweitzer Corporation**, Madison Heights, Mich.

[21] Appl. No.: **34,799**
[22] Filed: **Apr. 3, 1987**

Related U.S. Application Data

[63] Continuation of Ser. No. 832,007, Feb. 24, 1986, abandoned.

[51] **Int. Cl.**4 .... **F27B 9/02**
[52] **U.S. Cl.** **432/128**; 432/247; 432/251; 432/3
[58] **Field of Search** .... 432/247, 251, 3, 128, 432/164, 192; 110/336, 173 B, 332

[56] **References Cited**

U.S. PATENT DOCUMENTS

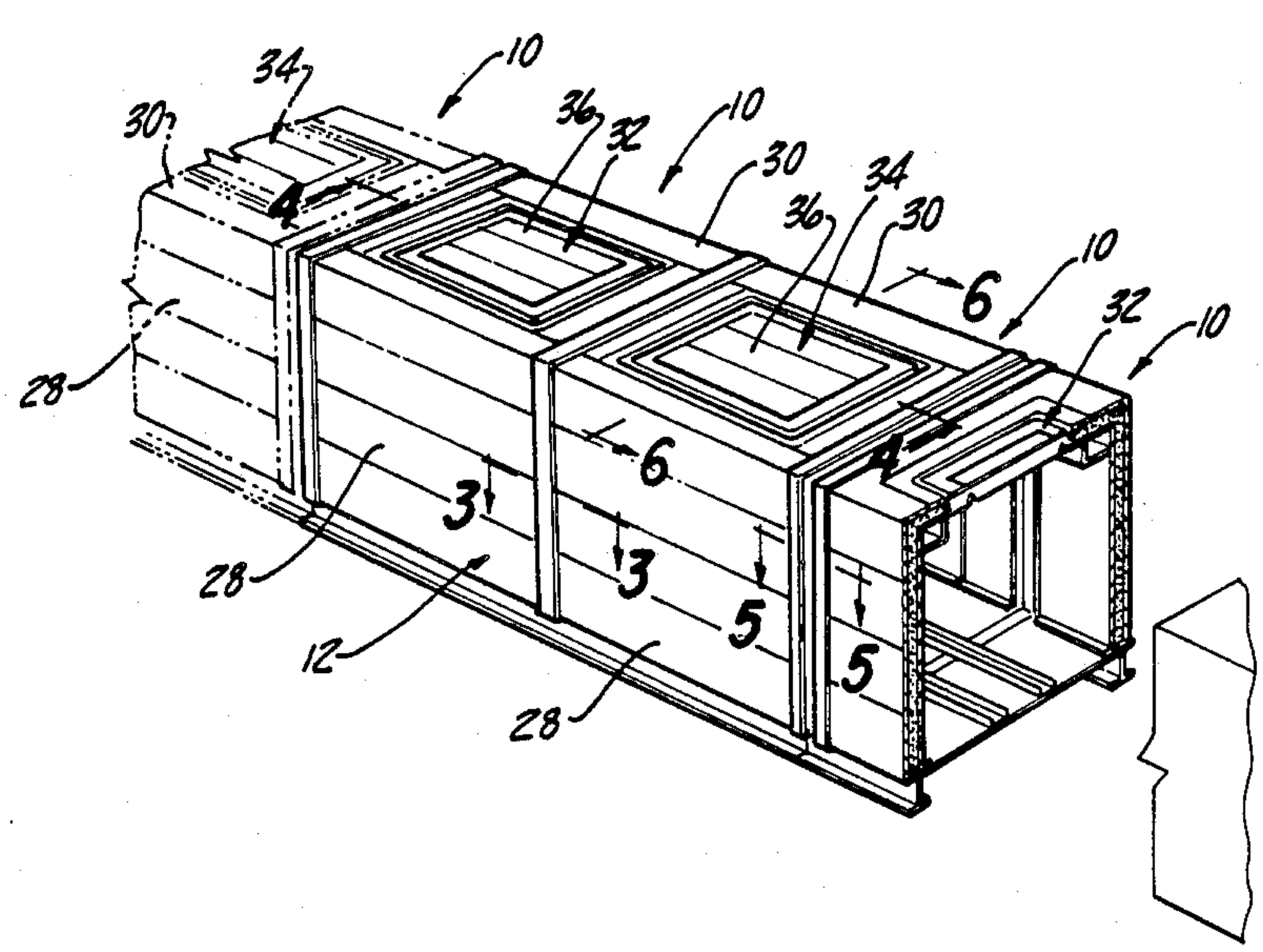
1,510,556 10/1924 Owens 432/128
1,577,487 3/1926 Otto 432/251
3,977,824 8/1976 Korting et al. 432/251
4,246,852 1/1981 Werych 432/247
4,249,888 2/1981 Werych 432/3
4,311,460 1/1982 Laversdorf et al. 432/251
4,334,862 6/1982 Muckelrath 432/128

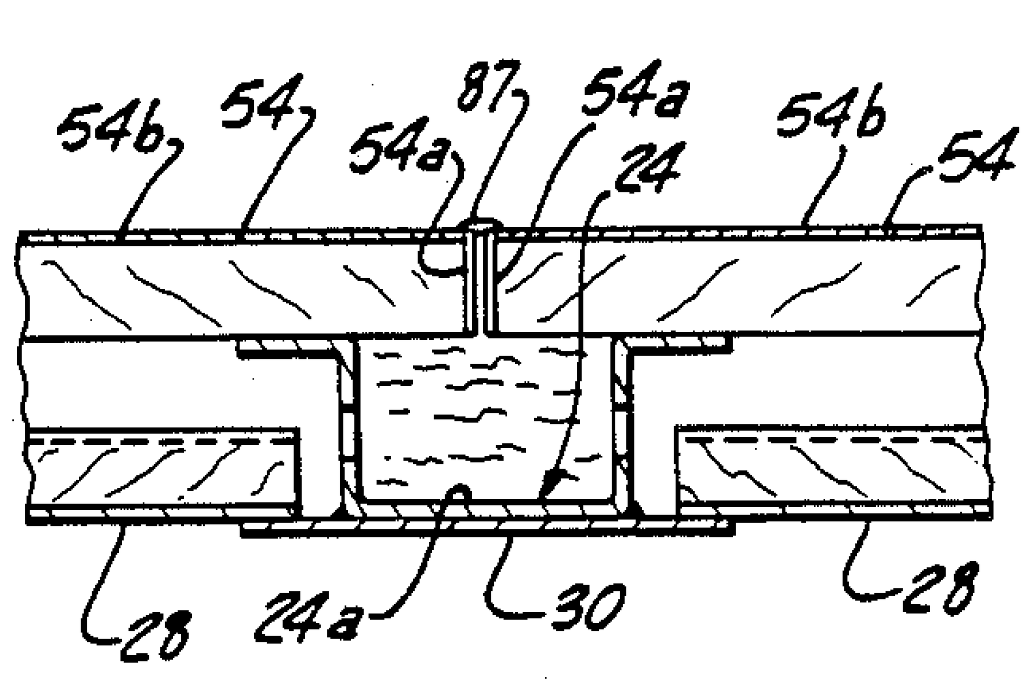
Primary Examiner—Henry C. Yuen
Attorney, Agent, or Firm—Niro, Scavone, Haller, Niro & Rocky, Ltd.

[57] **ABSTRACT**

An oven construction in which an elongated oven assembly is provided by manufacturing a plurality of oven modules at a factory location and then shipping the modules to the usage site where they are assembled together in end-to-end fashion to form the final oven assembly. Each oven module includes an outer shell and an inner shell mounted so as to be spaced apart for insulation therebetween. The shells are interconnected at one point along the length thereof, but are allowed to expand differentially along the remainder of their lengths. The outer shell is rigidly tied to a foundation but the inner shell, through any of various approaches, is allowed to slide or move relative to the foundation everywhere except the one point where it is secured to the outer shell. Each module has a bellows-type expansion joint around the periphery of one end to allow for interconnection of the modules, one to another.

3 Claims, 5 Drawing Sheets





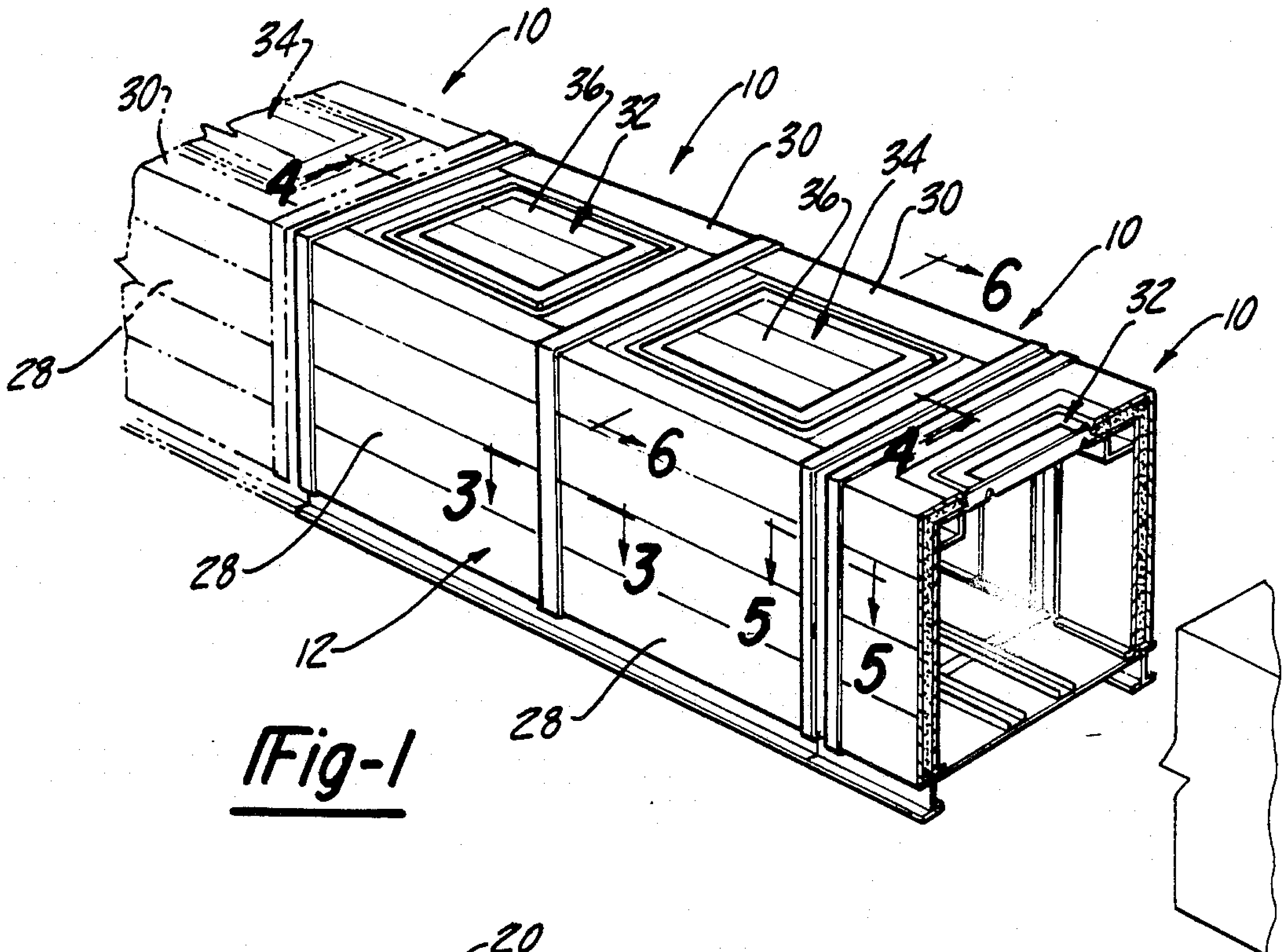


Fig-1

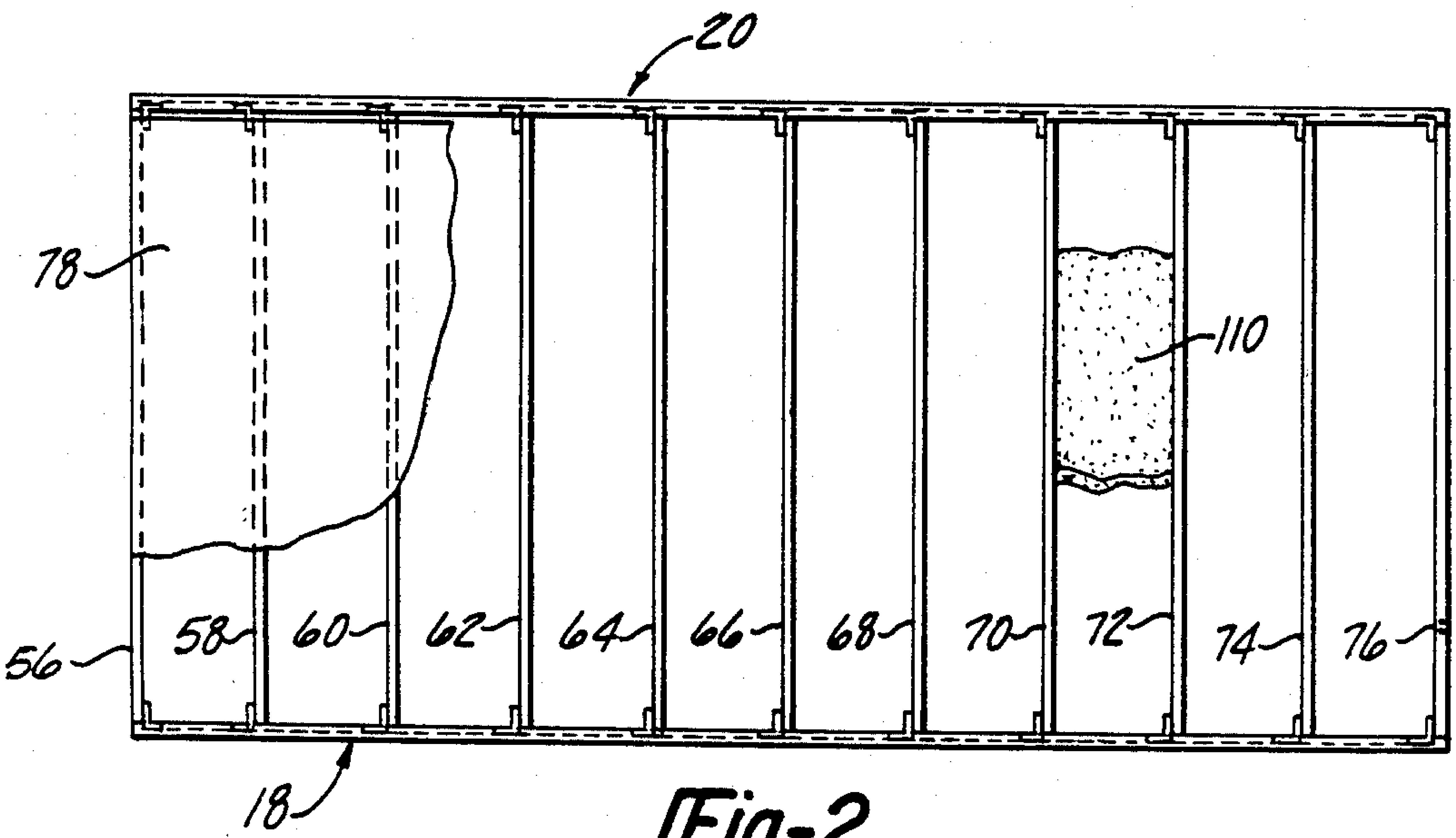


Fig-2

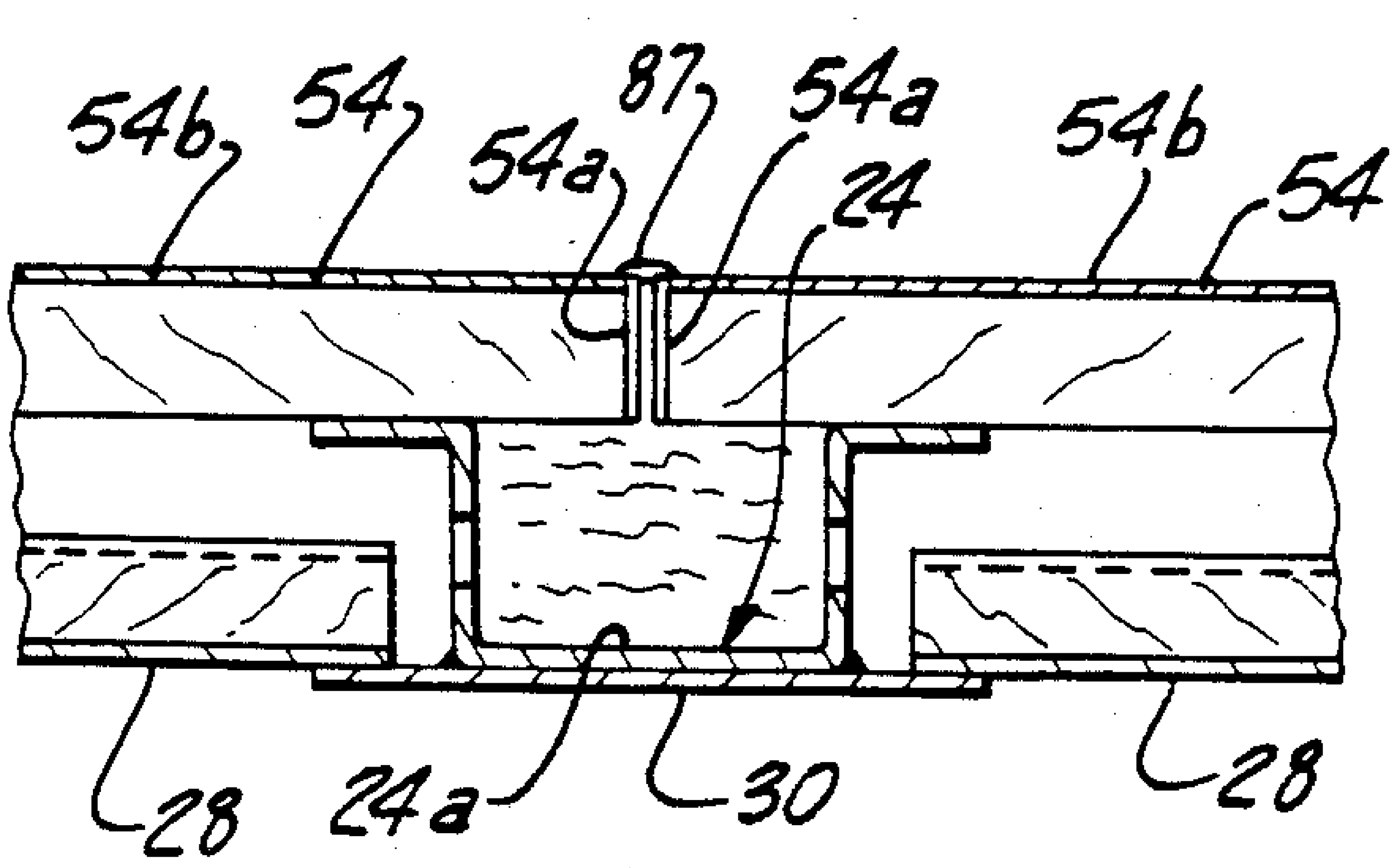


Fig-3

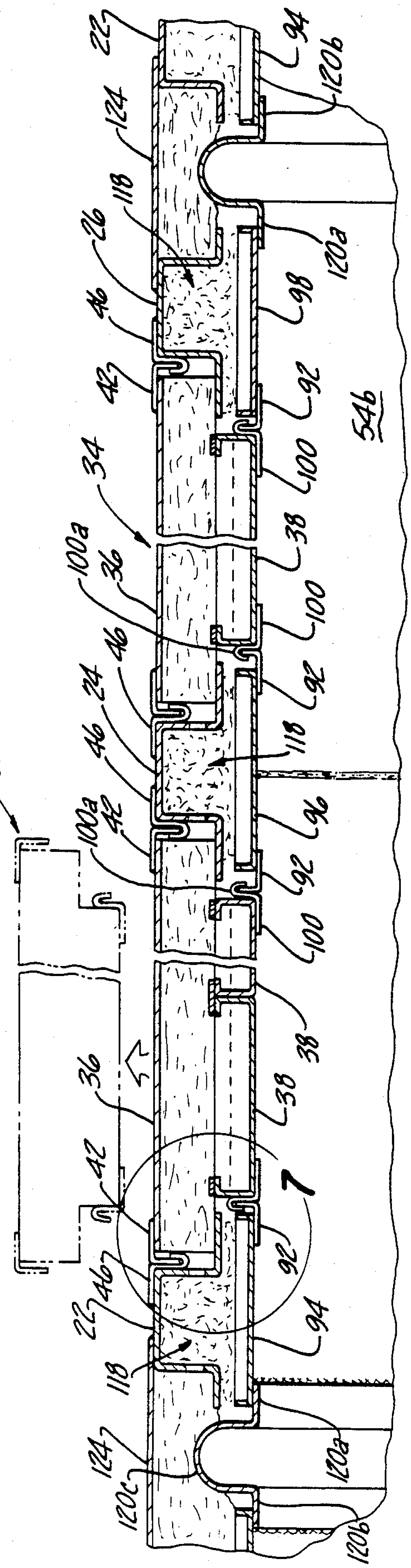


Fig-4

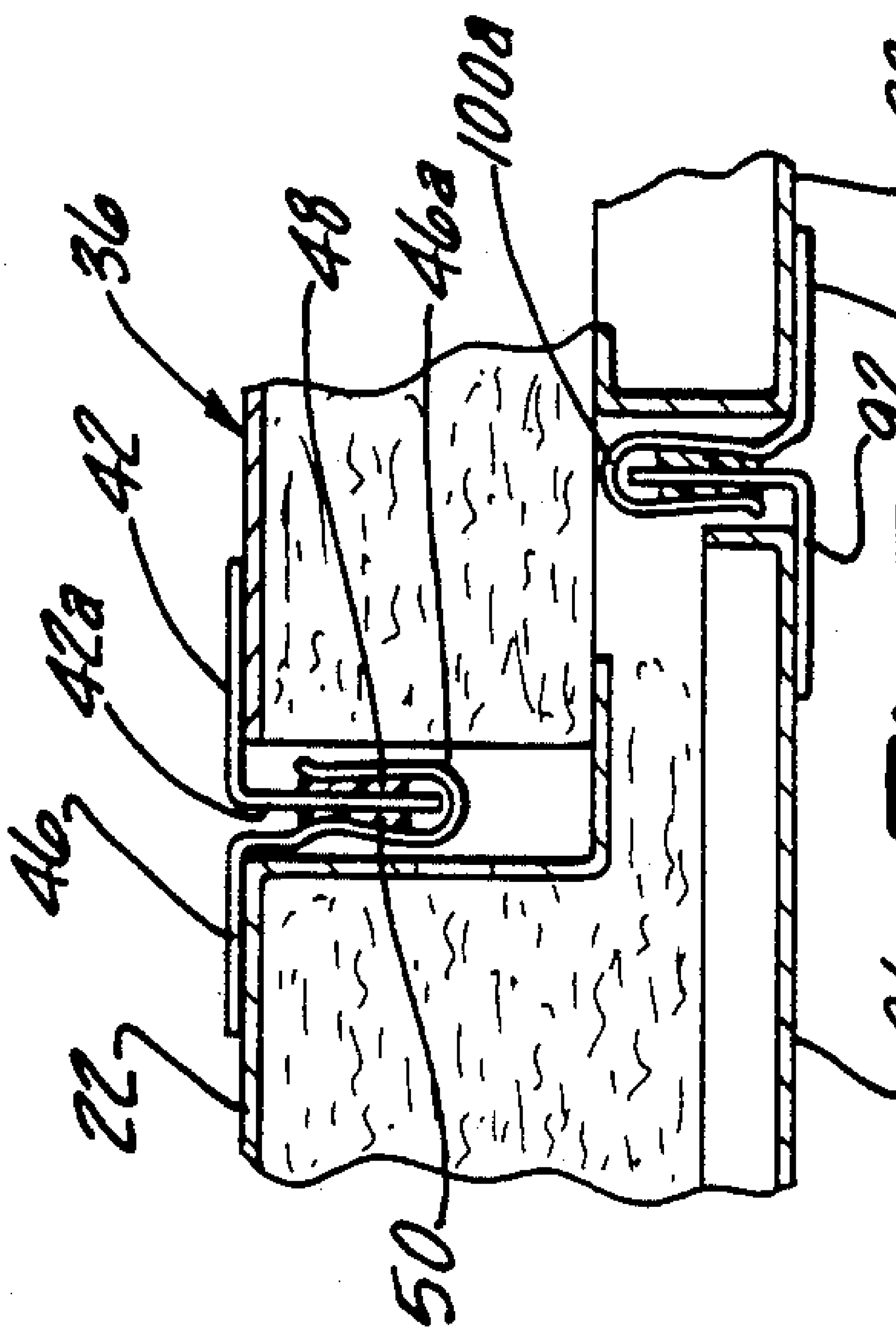


Fig-7

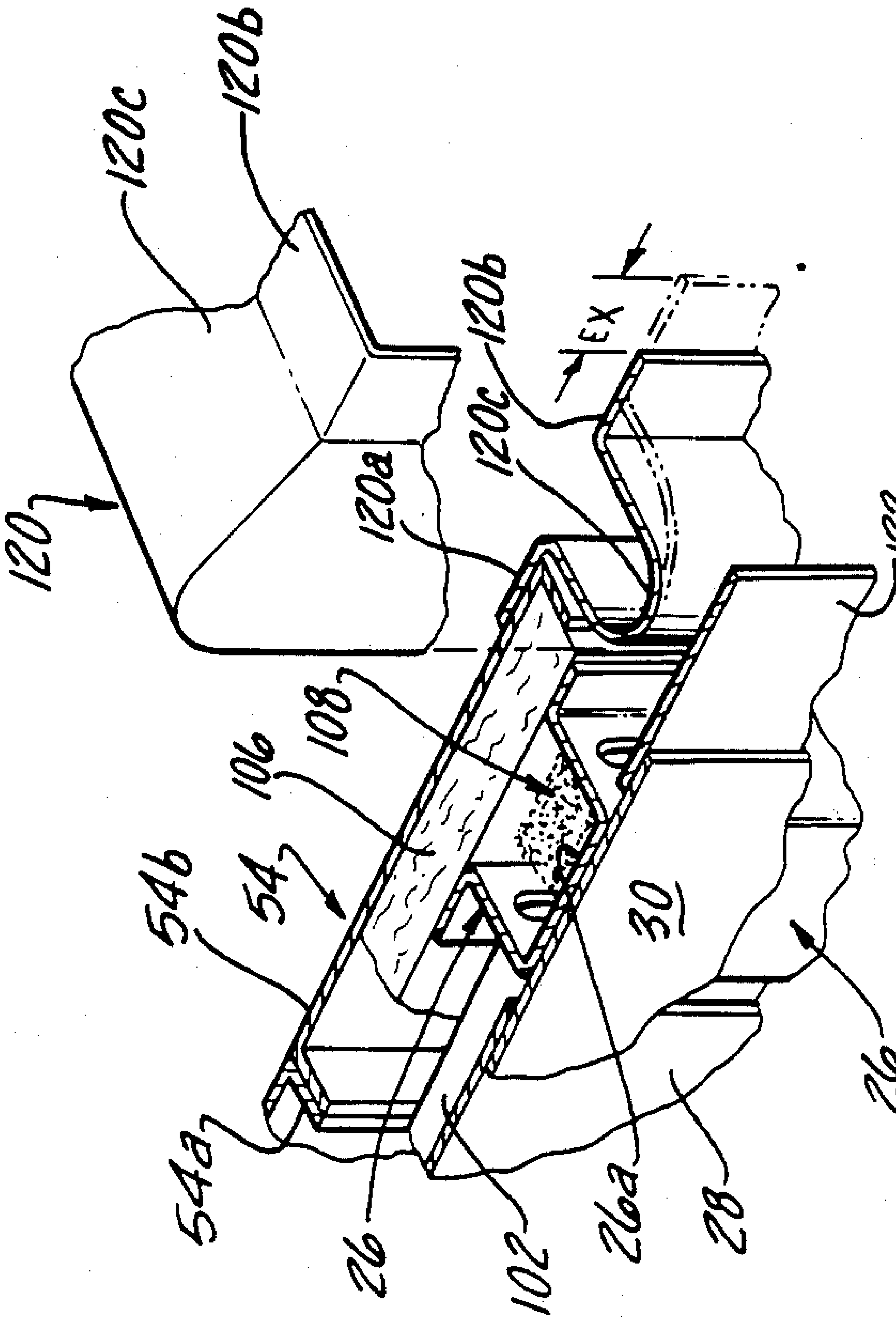


Fig-5

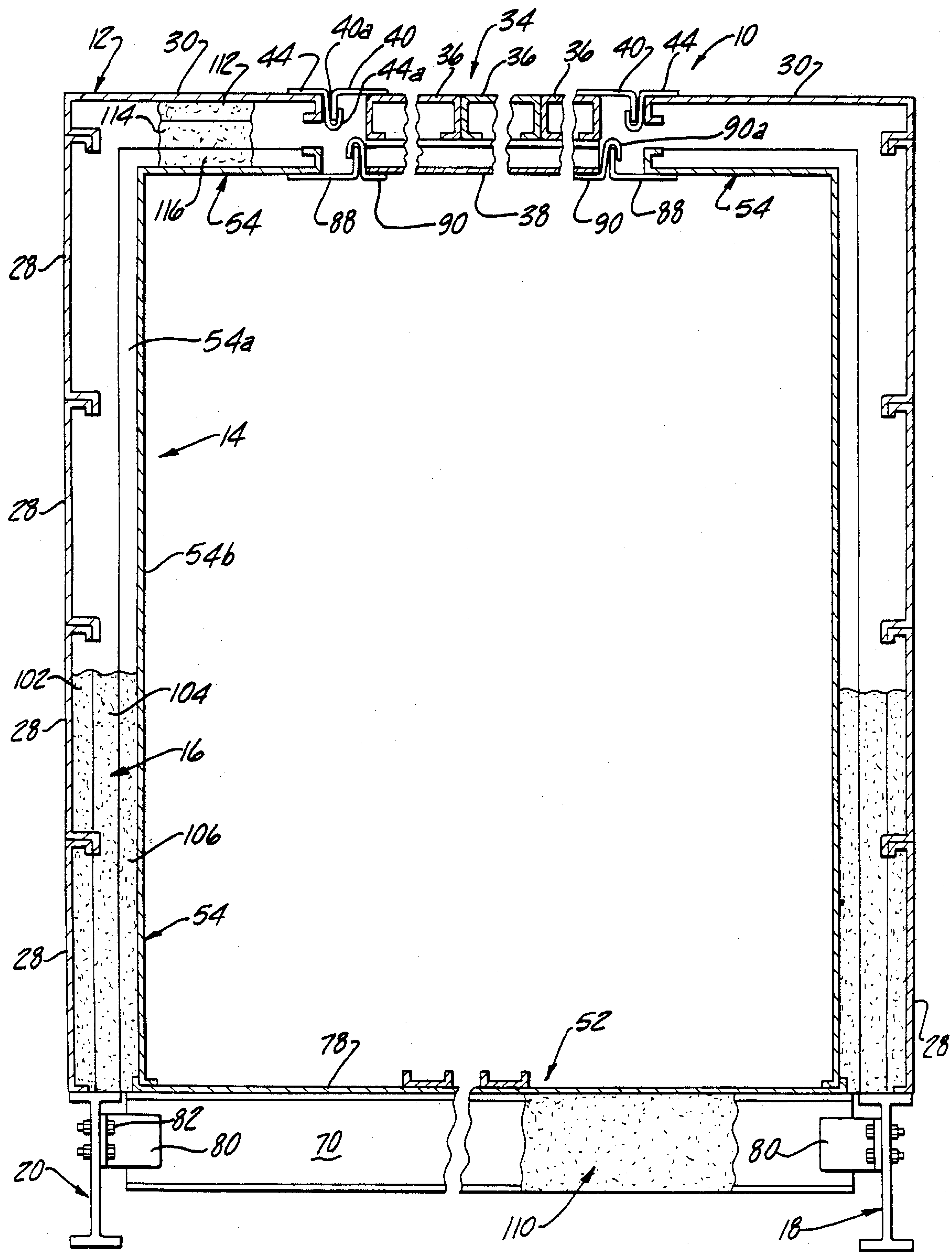

12
30
112
44
40a
40
44a
36
34
36
36
40
44
10
30
114
90a
116
54
88
90
38
90
88
54
28
54a
14
28
54b
102
104
28
16
106
54
28
52
28
78
82
80
70
80
20
110
18

Fig-6

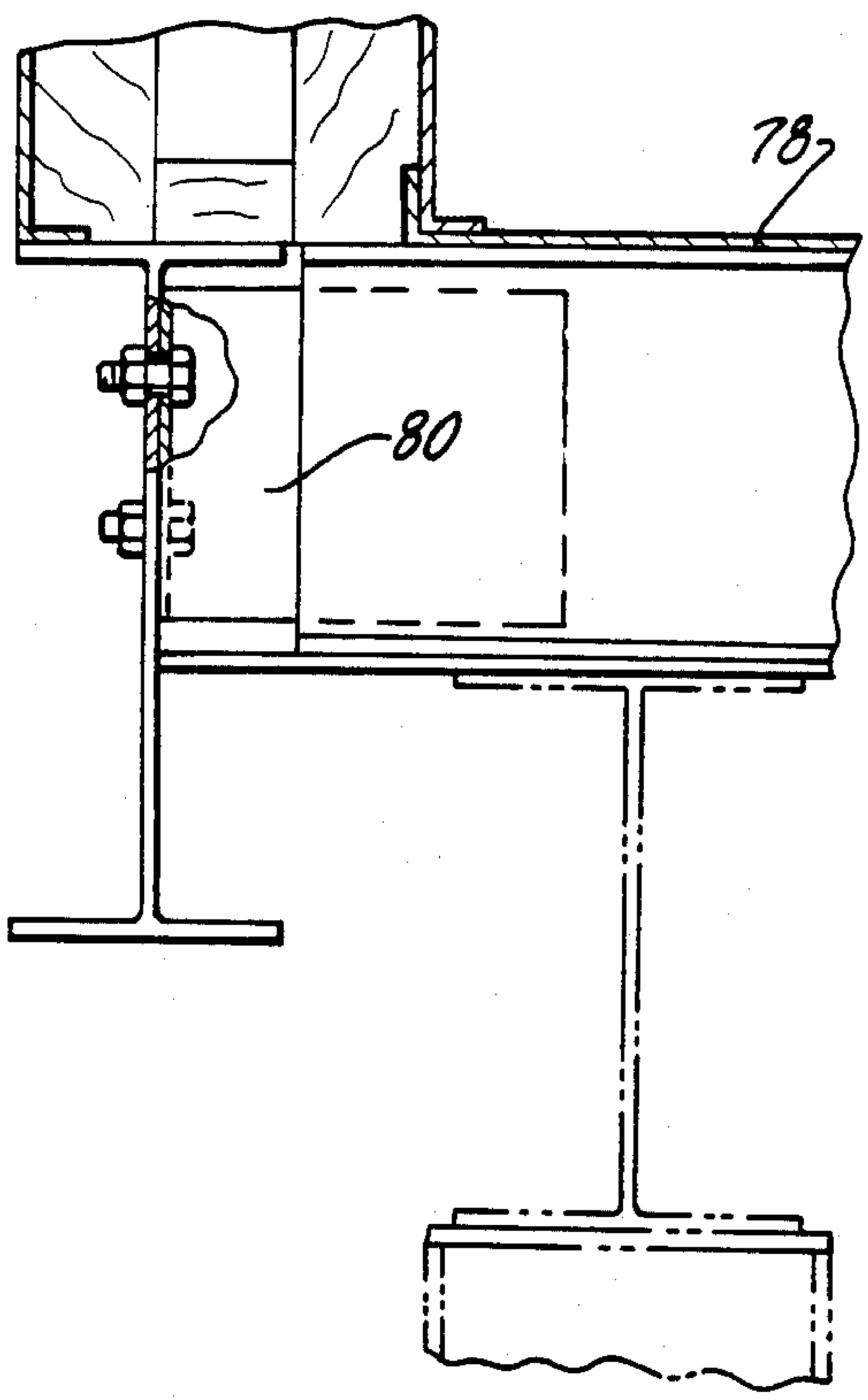


Fig-8

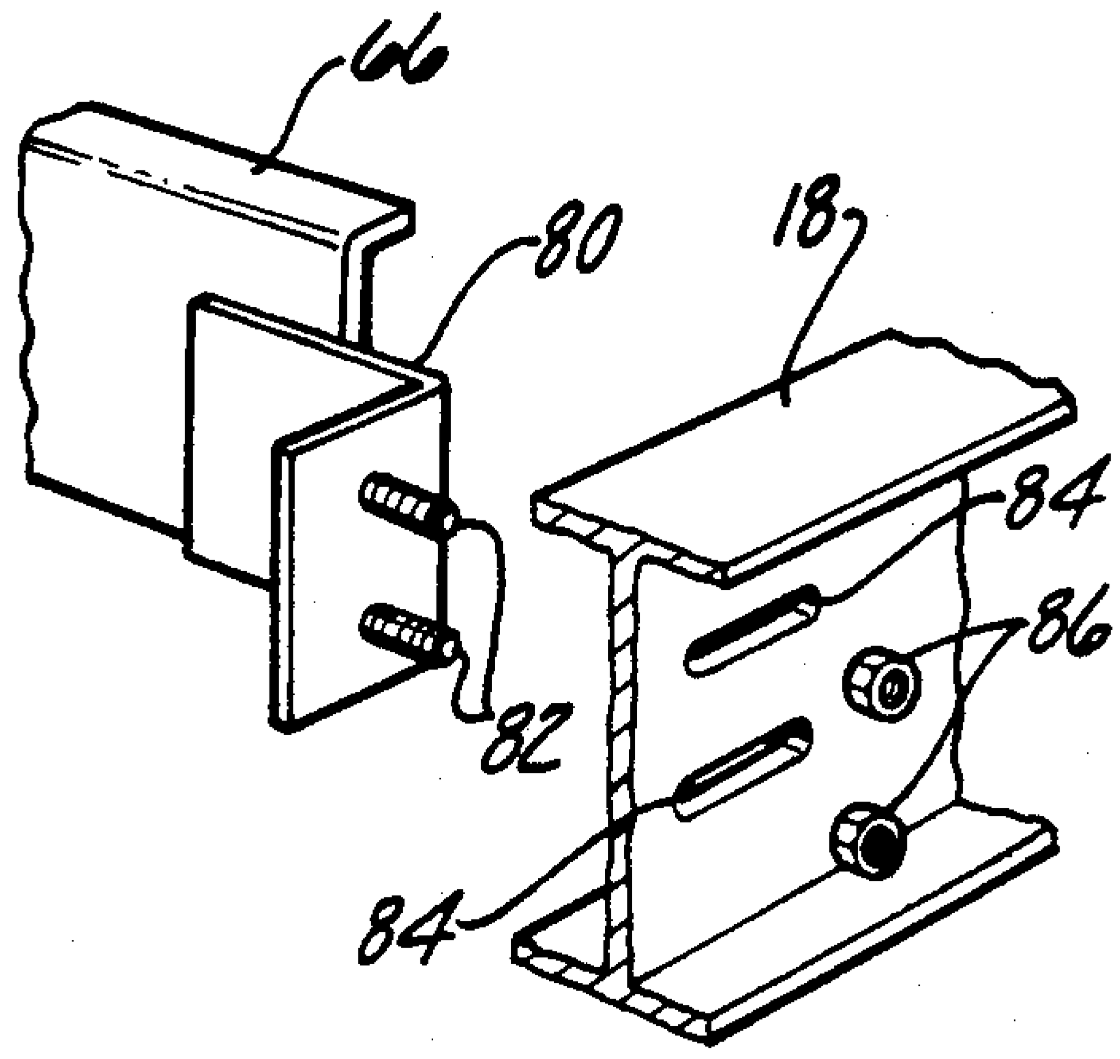


Fig-9

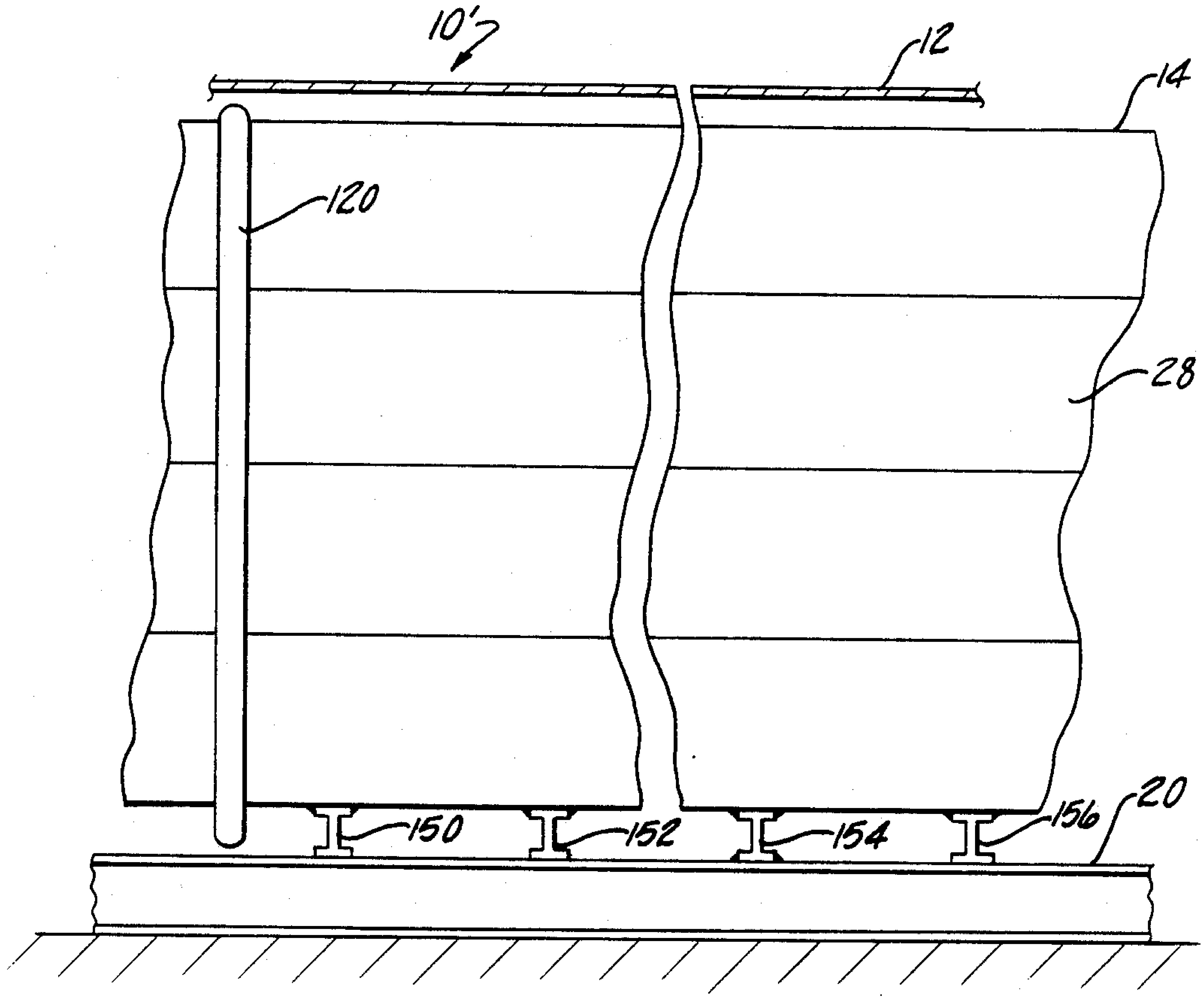

10'
12
14
120
28
150
152
154
156
20

Fig-10

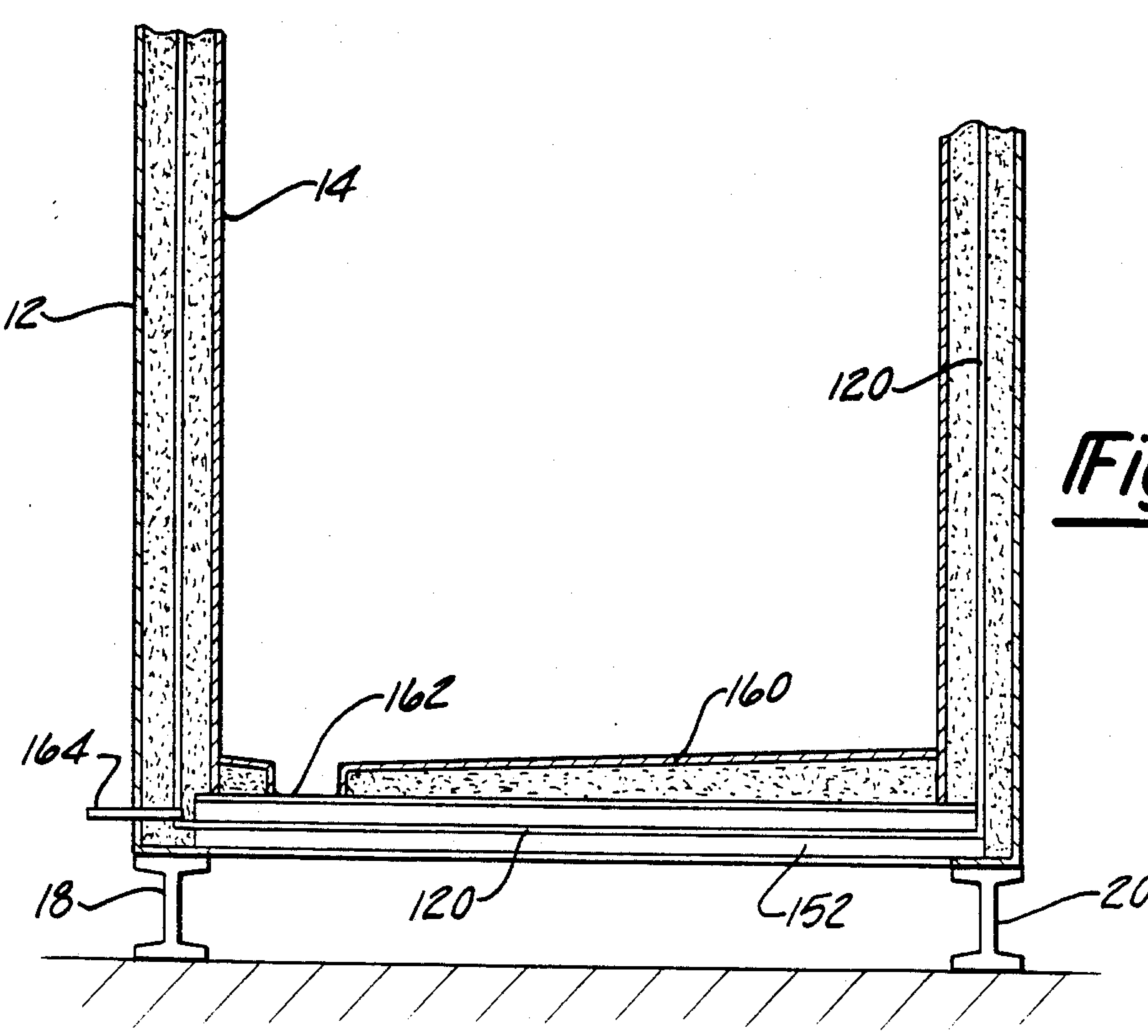

14
12
120
162
160
164
18
120
152
20

Fig-11

MODULAR OVEN

This is a continuation of co-pending application Ser. No. 832,007, filed on Feb. 24, 1986, now abandoned.

BACKGROUND OF THE INVENTION

This invention relates to ovens and more particularly to ovens for performing industrial functions such as drying paint and other coatings, curing laminates, and so forth.

Historically, industrial ovens have been built on site from oven panels which are a sandwich of sheet metal skins with insulation fill. These panels are typically joined together using an overlapping tongue and groove construction and the oven corner areas are sealed on an ad hoc basis using various clamping and gasketing methods.

This construction, while satisfactory in many operations, suffers from several disadvantages. Specifically, the construction method is labor-intensive since virtually all of the construction is performed on the site. Further, the resulting construction often suffers from relatively high heat loss due to leakage at seams. Further, this construction provides a structure which is difficult to clean because of the many irregularities in the interior surfaces, and further, because it allows cleaning water to seep into the insulation between the outer skins through the seams between the tongue and groove panels with consequent moisture problems, and derogation of the heat insulating capacity of the oven.

SUMMARY OF THE INVENTION

This invention is directed to the provision of an industrial oven which overcomes the disadvantages of the prior art ovens.

Specifically, this invention is directed to the provision of an industrial oven which is quickly and inexpensively erectable at the site by assembling modules in an end-to-end fashion; which has improved cleanability as compared to prior art ovens by virtue of a smooth, clean interior surface; and which precludes leakage of water, paint fumes or other substances into the insulation.

According to an important aspect of the present invention, the oven is built in modules at a factory location and the modules are shipped to the site for assembly to form the final oven. This allows factory control of the welding and assembly and results in a superior quality oven. This arrangement also reduces the labor cost significantly and results in a less expensive oven construction for a given oven capacity.

Each oven module comprises an outer longitudinally extending shell; an inner longitudinally extending shell positioned within the outer shell and substantially longitudinally coextensive with the outer shell; and means rigidly securing the inner shell to the outer shell at a predetermined interface location while allowing relative longitudinal movement between the shells along the remainder of the interface of the shells so that the inner shell may expand longitudinally from the connection point in response to heating of the oven.

According to a specific embodiment of the invention, the inner shell includes a rigid floor structure and the means securing the the inner shell to the outer shell is located at the longitudinal midsection of the floor.

According to a specific embodiment of the invention, the outer shell includes side rails forming the opposite lower longitudinal support for the outer shell; the floor structure of the inner shell includes a plurality of laterally extending cross rails at longitudinally spaced locations along the floor structure; and the inner shell is rigidly secured at its midsection to the midsection of the outer shell by rigidly securing the lateral ends of a central cross rail to the adjacent portions of the side rails of the outer shell.

According to the specific embodiment of the invention, other cross rails of the floor structure of the inner shell are secured to the adjacent portions of the side rails of the outer shell with a lost motion connection to allow movement of these cross rails relative to the outer shell.

In one specific embodiment of the invention, the lost motion connection between the cross rails of the inner shell and the side rails of the outer shell includes bolts projecting rigidly and laterally from the lateral ends of the cross rails for sliding receipt in longitudinally extending slots in the adjacent portions of the side rails of the outer shell so that the cross rails may be rigidly secured to the side rails by nuts engaging the bolts for secure shipment whereafter the nuts may be loosened to allow movement of the cross rails relative to the outer shell during use of the module in a drying oven environment.

In another specific embodiment, the floor of the inner shell is secured to cross beams at spaced intervals and these beams are allowed to slide on longitudinal rails to accommodate thermal expansion.

According to a further aspect of the invention, the oven comprises a plurality of longitudinally extending oven modules positioned in end-to-end relation to comprise an elongated continuous oven with each module including an outer longitudinally extending shell, an inner longitudinally extending shell positioned within the outer shell and substantially longitudinally coextensive with the outer shell, and means securing the inner shell to the outer shell at the interface of the longitudinal midsections of the shells while allowing relative longitudinal movement between the shells along the remainder of the interface of the shells so that the inner shell may expand outwardly from its midsection in response to heating of the oven. An expansion joint interconnects the ends of the inner shell of each module to the adjacent end of the inner shell of the adjacent module to allow the adjacent inner shell ends to freely expand and retract relative to each other in response to heating of the oven.

According to a further feature of the invention, each inner shell of each module is tubular and defines a sealed longitudinally extending chamber and each expansion joint is annular and extends sealingly around the entire annular interface between adjacent ends of the adjacent inner shells to allow expansion between the adjacent ends while providing a continuous elongated sealed chamber extending the entire length of the oven.

According to a further feature of the invention, an oven is provided in which a plurality of tubular inner modules are positioned end-to-end within an outer shell assembly with insulative space between the confronting surfaces of the inner module and the outer shell; insulative material is positioned within the insulative space which substantially fills the space but allows relative longitudinal movement between the tubular modules and the outer shells; the tubular modules are mounted within the outer shell assembly for longitudinal movement relative to the outer shell assembly to allow the inner shell assembly to expand longitudinally in response to the heating of the oven; and expansion joint means are provided at the adjacent ends of the tubular modules which sealingly but expansably interconnect the adjacent ends to provide a sealed, longitudinally extending inner chamber while allowing relative movement between the modules as the inner shell assembly expands within the outer shell assembly.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is fragmentary perspective view of an oven assembly according to the invention;

FIG. 2 is a plan view of the floor structure of an oven module employed in the oven assembly of FIG. 1;

FIG. 3, 4, 5, and 6 are cross sectional views taken respectively on lines 3—3, 4—4, 5—5, and 6—6 of FIG. 1;

FIG. 7 is an enlarged view of a portion of the oven construction seen in circle 7 of FIG. 4;

FIG. 8 is a fragmentary cross sectional view showing a lost motion connection employed between the inner and outer shell of the invention oven module; and

FIG. 9 is a fragmentary perspective view showing further details of the manner in which the inner and outer shells of the invention oven module are interconnected;

FIG. 10 is a partial side view of an alternative embodiment of the invention; and

FIG. 11 is an end view in section of a still further embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The illustrative oven is formed by placing a plurality of oven modules **10** in end-to-end relation to form a final continuous oven having a length corresponding to the aggregate length of the individual modules. For example, each module **10** may have a length of 25 feet so that the final oven has a total length in feet that is the sum of the number of modules multiplied by 25. Four modules are shown in FIG. **1** disposed end-to-end, with the left hand module shown fragmentarily and in phantom, the center two modules shown solid and complete, and the righthand module shown fragmentarily and in cross section to reveal details of the inner construction.

Each module **10**, broadly considered, includes an outer shell assembly **12**; an inner shell assembly **14**; and insulative means **16** interposed between the inner and outer shells. The shells may be made of various materials such as steel, galvanized or aluminized steel, stainless steel, and various coated or plated metals.

Outer shell assembly **12** includes a pair of side rails **18** and **20** forming the opposite lower longitudinal edges of the shell; strong back structures **22**, **24**, and **26** positioned at the midsection of the shell and at each end of the shell; and panels **28** extending longitudinally between the strong back structures.

Side rails **18** and **20** have an I configuration and extend the full length of the oven module.

Strong back structures **22**, **24**, and **26** have a hat-shaped cross sectional configuration and extend in a U form upwardly along one side of the module, transversely across the top of the module, and then downwardly along the other side of the module. Each strong back structure is rigidly secured by welding at its lower ends to the respective upper faces of side rails **18** and **20**.

Panels **28** have a generally U-shaped cross sectional configuration and extend longitudinally between the strong back structures with their opposite ends weldingly secured to the inner faces of flashing plates **30** weldingly secured to the outer face of the central or web portion **22*a***, **24*a***, and **26*a*** of the respective strong back structure. Panels **28** are stacked one on top of each other in nesting configuration and are welded together continuously along their adjacent seams and along the seam formed between the lower panel **28** and the side rails **18** and **20** to form smooth continuous side walls for the outer shell.

The roof of the outer shell is formed by panels **30** nesting at their outer edges on the top edge of the topmost side panel **28** and extending longtudinally between the strong back structures and weldingly secured thereto. The roof of the outer shell is further formed by a pair of explosion panels **32** and **34** positioned between roof panels **30** and between the strong back structures **22**, **24**, and **26**.

Each explosion panel **32**,**34** is a composite structure formed of a plurality of longitudinally extending U-shaped panels **36** positioned on top of a plurality of transversely extending U-shaped panels **38** with the panels welded in a continuous manner to form a continuous composite structure. Flashing strips **40** and **42** comprise outer connecting elements of roof panels **32**, **34**. Flashing strips **40** are secured along the longitudinal edges of explosion panels **32**,**34** and flashing strips **42** are secured along the lateral edges of explosion panels **32**,**34**. Flashing strips **44** and **46** comprise outer fastening elements of modules **10**. Further flashing strips **44** are secured along the longitudinal inboard edges of roof panels **30** and further flashing strips **46** are secured along the inboard lateral edges of strong back structures **22** and **26** and along both lateral edges of central strong back **24**. Flashing strips **44** and **46** include upwardly opening U-shaped trough portions **44*a***,**46*a*** and gasket material **50** is positioned in troughs **44*a***,**46*a***. Flashing strips **40** and **42** include downturned outboard end portions **40*a***,**42*a*** which are sealingly received in the gasket material **50** positioned respectively in trough portions **44*a***,**46*a*** to position explosion panels **32** and **34** firmly and sealingly within the roof structure of the outer shell of the oven module.

Inner shell **14** includes a floor structure **52** and a plurality of panels **54**.

Floor structure **52** includes a plurality of longitudinally spaced cross beams **56–76** of channel configuration and a floor plate **78** overlying cross beams **56–76**. Cross beams **56–76** extend laterally between the side rails **18** and **20** of the outer shell structure. Floor plate **78** is rigidly welded to central cross beam **66** but is not welded or otherwise secured to any of the other cross beams. Angle brackets **80** are welded to the lateral ends of each of the cross beams. The angle brackets **80** secured to the lateral ends of central beam **66** are fixedly welded to the adjacent face of side rails **18** and **20** and the angle brackets **80** associated with the other cross beams are connected to side rails **18** and **20** by a lost motion connection best seen in FIGS. **8** and **9**. Each lost motion connection comprises a pair of bolts **82** welded to the associated angle bracket **80** and projecting laterally therefrom for passage through longitudinally extending slots **84** in the adjacent portion of the side rail **18**,**20** so that the associated cross member may be rigidly secured to the side rails **18**,**20** by tightening of nuts **86** or may be allowed to slide longitudinally relative to the side rails by loosening nuts **86**.

Panels **54** are arranged in upstanding side-by-side relation along the longitudinal edges of floor structure **52**. Each panel **54** has a U-shaped configuration with the edge flanges **54a** of the panels abutting in the assembled relation of the panels and the main body portions **54b** of the panels presenting a flush smooth interior surface for the oven. Panels **54** are continuously welded at their lower edges to floor plate **78** and continuously welded, as seen at **87**, along the interface of edge flanges **54a** to form smooth, sealed continuous walls within the oven.

The roof of inner shell **14** is provided by inward integral extensions of side panels **54** and by the inner structures of explosion panels **32** and **34**. Explosion panels **32** and **34** are sealingly received in inner shell **14** in a manner similar to their receipt in outer shell **12**. Thus, flashing strips **88** extending along the longitudinal inner edges of panels **54** coact with gasket material **50** received within the trough portion **90a** of flashing strips **90** secured to the inner longitudinal edges of explosion panels **32,34** and flashing strips **92**, secured to flashing panels **94, 96**, and **98** extending transversely of the inner shell beneath the roof portions of strong backs **22, 24**, and **26** are received in the trough portions **100a** of flashing strips **100** secured to the lateral inner edges of explosion panels **32,34**. Thus, upstanding flashing strips **90** and **100** comprise inner connecting elements of roof panels **32, 34**; whereas, upstanding flashing strips **88** and **92** comprise inner fastening elements of modules **10**. Flashing panels **94, 96**, and **98** are suitably secured, as by welding, to the roof portions of the respective strong back structures.

Insulation **16** generally fills the spaces between the outer surfaces of inner shell **14** and the inner surfaces of outer **12**. Specifically, insulation **16** in the side walls of the oven module includes three layers of bat-type insulation **102, 104**, and **106** which together form a laminar construction filling the space between the inner and outer shells. Loose insulation **108** fills the interior of the side portions of strong back structures **22, 24**, and **26** to complete the insulation of the side walls.

The insulation of the floor of the oven module is accomplished by rigid insulation panels **110** positioned between cross beams **56–76** and totally filling the space between the cross beams so as to form a total and continuous blanket of insulation beneath floor plate **78**.

The insulation in the roof of the oven module comprises batting layers **112, 114**, and **116** interposed between the roof panels **30** and the inwardly directed portions of inner panels **54**; suitable batting positioned within the channels **36** and **38** of explosion panels **32** and **34**; and loose insulation **118** filling the hollows of the roof portions of strong structures **22, 14**, and **26** and the areas defined between the strong back structures and the flashing members **94, 96**, and **98**.

In use, each oven module **10** is assembled at a factory location under strict material and quality control standards. The modules are then shipped to the site location where they are assembled together with a minimum of onsite labor and materials to form the final elongated oven assembly. Specifically, each oven module, as it is constructed at the factory, includes a complete outer shell assembly **12** and a complete inner shell assembly **14** positioned nestingly within outer shell assembly **12** with insulative material totally filling the spaces within the shells and with the central cross beam **66** of the floor structure of the inner shell assembly rigidly secured at its lateral ends to the side rails of the outer shell and the other cross beams of the floor structure secured at their lateral ends to the side rails of the outer shell by the lost motion connections comprising bolts **82** and slots **84**. During shipment of the modules to the site, nuts **86** are tightened on bolts **82** to prevent damage to the oven module during shipment. The factory module also includes an expansion flashing at one end of the module in the form of an annular bellows **120**. Bellows **120** includes flange portions **120a** and **120b** and a central expansion or bellows portion **120c**. At the factory flange portion **120a**, for example, is weldingly and sealingly secured to one end of the inner shell assembly. Specifically, flange portion **120a** is weldingly secured along its vertical edges to the inner face of the end inner panel **54**; is secured along its upper or roof portion to the inner surface of flashing **98**; and is secured along its lower portion to floor plate **78**.

Once the factory assembled modules arrive at the site, they are positioned in end-to-end relation to form the total elongated oven assembly, the free flange **120b** at each expansion bellows is suitably weldably secured to the adjacent end of the inner shell of the adjacent module and further flashing material is positioned at the interfaces of the modules to complete the total assembly. Specifically, flange portion **120b** of each annular bellows **120** is secured along its vertical edges to the end inner panels **54** of the adjacent oven modules; is secured along its roof portion to the inner surface of flashing **94** of the adjacent oven module; and is secured along its lower edge to the floor plate **78** of the adjacent module. The adjacent ends of the outer shell assemblies are then sealed by a flashing assembly comprising vertically extending flashing strip **122** positioned between flashing strips **30** and a roof flashing strip **124** suitably secured to the roof portion of the strong back **26** of one outer shell and the roof portion of the strong back **22** of the adjacent outer shell.

In the final assembled configuration of the oven bellows members **120** form continuous annular seals between adjacent oven modules and provide a continuous elongated sealed chamber extending the full length of the assembled modules.

In use, nuts **86** are loosened to allows bolts **82** to move freely in slots **84** so that cross beams **56–64** and **68–76** may move freely relative to the outer shell. As the oven becomes heated in use, the inner shell of each module may expand outwardly and longitudinally relative to the outer shell of that module from the fixed midsections of the inner and outer shells with the expansion being accommodated by flexing movement of the bellows portions **120c** of the bellows **120**. In the event of a buildup of excessive pressures within the oven, explosion panels **32** and **34** pop outwardly to relieve the excessive pressure within the oven.

The oven assembly of FIGS. **1–9** will be seen to provide many important advantages as compared to prior art oven assemblies. Specifically, since the construction lends itself to modular construction, a vast majority of the construction may be performed in a factory environment with skilled labor and strict quality control to ensure the formation of a quality and uniform product. Specifically, the oven modules are constructed with a high degree of precision and provide a continuous sealed inner chamber for the oven which is uninterrupted throughout the floor, sides or ceiling of the oven and which accordingly precludes the entry of water, fumes or paint into the area between the inner and outer shells of the oven. The smooth interior construction of the inner shell also facilitates cleaning of the oven since there are no nooks, crannies or crevices in which water can collect or which complicate the cleaning operation. In fact, the smooth interior surface of the invention oven module allows the total oven assemblies to be cleaned in a simple hosing operation.

Further, the described construction allows the modules to be assembled at a factory location and shipped without damage to the usage site and yet allows the individual module in use to expand to accommodate the severe heat of the oven. Specifically, the invention arrangement whereby the midsections of the inner and outer shells are rigidly joined but the end portions of the inner shells are allowed to move longitudinally with respect to each other enables the inner and outer shells to be rigidly secured together for shipment and then loosened at the usage site to allow the required expansion as between the various parts of the inner and outer shells.

The described construction also achieves a significant reduction in heat loss through the walls of the oven due to the superior quality control and the superior insulation construction and techniques made possible by the factory construction of the modules.

The described construction also, by virtue of performing the vast majority of work at the factory, enables rapid assembly of a completed oven and, specifically, allows a total oven assembly to be installed during factory shutdowns.

In summary, the described oven construction allows an oven of superior quality to be constructed and installed in less time and at less expense than prior art constructions.

Whereas a preferred embodiment of the invention has been illustrated and described in detail, it will be apparent that various changes may be made in the disclosed embodiement without departing from the scope or spirit of the invention. By way of example, the cross-sectional shape of the modules need not be square or rectangular, but may assume virtually any desired shape such as semi-circular, semi-elliptical, and so forth; further, the strongback structures **22,24,26** may not be needed in all embodiments; as an alternative, frames may be installed at the ends of the modules for shipping purposes, and may be removed at the time of assembly of the modules, one to another; further, the blow-off roof panels are optional and are not needed, for example, where the oven use does not involve combustible vapors or effluents; further, the panels **28** need not run horizontally, but could also be vertically arranged. Finally, it is not essential that the inner shell be secured to the cross beams and that the cross beams slide in the slots of the longitudinal beams. It is equally feasible, and within the scope of the present invention, to rigidly connect all of the beams, both longitudinal and lateral, to one another and allow the inner shell to slide longitudinally over both beams as it expands, the inner shell being fixed to a lateral beam at some predetermined point such as the middle.

Another similar and alternative construction is shown in FIGS. **10** and **11** where outer shell **12** is secured throughout its length (but not necessarily continuously) to longitudinal beams or rails **18** and **20** (only **20** is shown) and as before the floor of inner shell **14** is welded or otherwise rigidly connected to spaced, parallel cross beams **150**, **152**, **154** and **156**; beam **154** is located substantially at the center of the module **10'** shown. Inner shell **14** is spaced from outer shell **12** to allow for insulation (not shown).

Beams or rails **18,20** may be provided at the construction site as part of the foundation or they may be brought with the module **10'**, the former being preferred. Only cross beam **154** is fixed by welding or bolts or other conventional means to the longitudinal rails **18** and **20**, all of the other cross beams **150**, **152** and **156** being allowed to slide over rails **18** and **20** as necessary to accommodate thermal expansion. Again, the common concept with the embodiment of FIGS. **1-9** is to tie the inner and outer shells **14** and **12** together and to an external support at a single common point along the length of each module, allowing the two units to move longitudinally relative to one another over the balance of their lengths. As before, expansion joints **120** provide differential expansion freedom as between modules while tying them together with final, common unit.

FIG. **11** illustrates a further refinement of the invention, useful in any and all of the specific embodiments already described, to enhance the washdown process.

As in the previous embodiment, outer shell **12** is seated on and connected to longitudinal rails **18** and **20**, and is spaced from inner shell **14** to allow for the expansion joint **120**, which runs entirely around the periphery of each module connection joint, and for insulation as shown. The inner shell **14** rests on cross beams **152** and may be rigidly fixed thereto in the previously-described embodiment where beams **152** slide on rails **18** and **20**. The inner shell **14** has on the interior thereof a false floor **160** which slopes from both sides toward a laterally-offset, longitudinally-running drain trough **162** for the purpose of collecting wash water and conveying it longitudinally to the next adjacent lower expansion joint portion **120**. Since this expansion joint portion **120** is concave when viewed from inside the structure, and is lower than the trough **162**, it may be used as a collector to convey the wash water laterally to a drain pipe **164**. As before, the shells or boxes **12** and **14** need not be square or rectangular in section.

We claim:

1. An oven comprising:

a plurality of longitudinally extending oven modules positioned in end-to-end relation;

each of said modules having an outer shell and an inner shell and insulating material disposed between said shells;

at least one of said modules having a roof panel including self-releasing connector means for joining said panel to said one module;

said connector means including inner connecting elements adapted to engage inner fastening elements disposed on the inner shell of said one module and outer connecting elements adapted to engage outer fastening elements disposed on the outer shell of said one module;

said respective connecting elements and fastening elements having a configuration to permit self-releasing disengagement upon a sudden increase in pressure within said oven and to thereby allow separation of said panel from said one module without substantial damage to said one module;

said connector means also including a seal between said panel and said one module; and

said connecting elements and fastening elements forming movable joints to permit relative movement between said panel and said one module due to thermal expansion and contraction.

2. The oven of claim **1** wherein said inner connecting elements are positioned to pass between said outer fastening elements as said roof panel disengages from said one module.

3. The oven of claim **1** wherein said inner connecting elements comprise upstanding flanges with inverted U-shaped members and said outer connecting elements comprise depending generally flat flanges; and wherein said inner fastening elements comprise upstanding generally flat flanges adapted for receipt within said inverted U-shaped members, and said outer fastening elements comprise depending flanges with U-shaped members adapted to receive said depending flat flanges.

* * * * *